

Name _____ Date _____ Period _____

TRENDS AND PERIODICITY INTRODUCTION

The periodic table is an organization of all known elements. The table consists of horizontal rows called periods and 18 vertical columns called groups (families). All the elements on the periodic table are arranged according to atomic number. All the physical and chemical properties associated with the electronic structure of atoms show periodicities (cycles). The periodicity of elements is a function of the atomic number. Periodicity refers to the pattern of activities among elements across a period of elements and within a group of elements.

A period is a horizontal row of elements; there are 7 periods on the table (see Figure #1). Within a period of elements, the atomic number increases. One proton and one electron are added to each successive element as a period is filled.

Period 1	1															2		
Period 2	3	4											5	6	7	8	9	10
Period 3	11	12											13	14	15	16	17	18
Period 4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Period 5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Period 6	55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Period 7	87	88	89	104	105	106	107	108	109	110								

58	59	60	61	62	63	64	65	66	67	68	69	70	71
90	91	92	93	94	95	96	97	98	99	100	101	102	103

FIGURE #1

Groups (vertical columns) of elements are sometimes called families. Elements in the same family show “family characteristics” just as animals or plants in taxonomic families share many similar characteristics. All species of pine family (Pinaceae) have needle-like leaves and produce seeds in cones. By contrast, all species in the palm family (Palmaceae) have broad frond-like leaves and produce seeds in fruits. Although pines and palms have many things in common, their family characteristics distinguish them from each other. The same is true among elements.

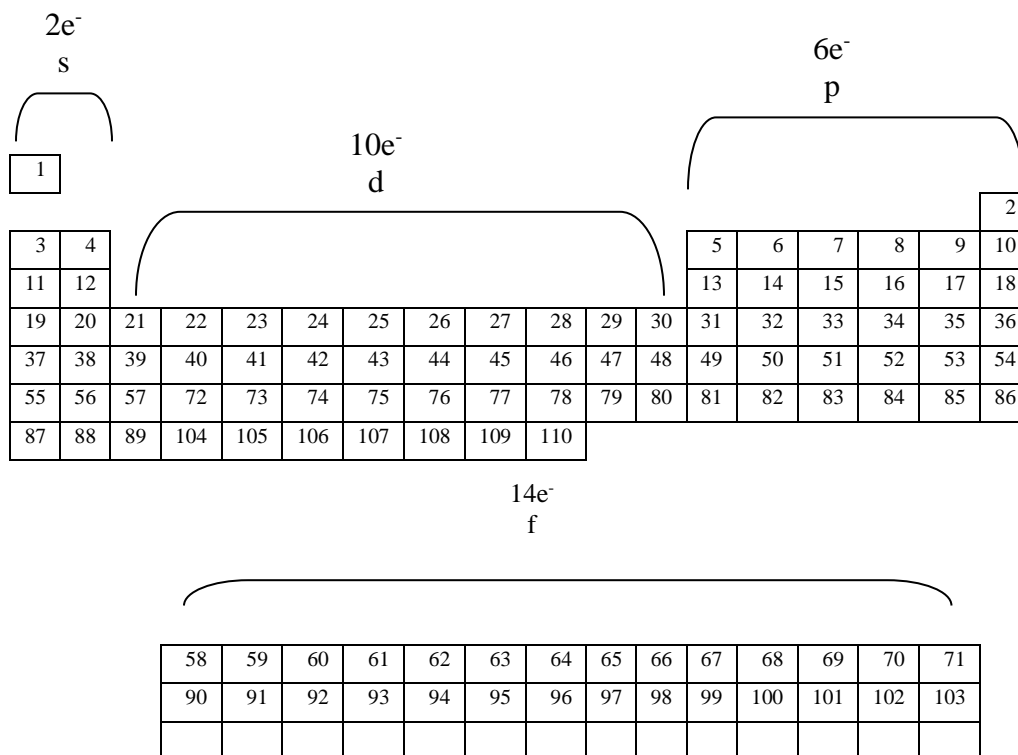


FIGURE 2

Look carefully at the patterns (periodicity) among the electrons of each group in Figure #2. Periodicity of electron configuration underlies periodicity in chemical and physical properties.

As you prepare to investigate the periodicity of the elements, keep in mind these general principles:

- An element has the same number of protons as electrons. The number of protons is the atomic number of the element.
- The electrons exist outside the nucleus of an atom in orbitals.
- The outer electrons of an atom, which are those involved in chemical reactions (bonding), are referred to as valence electrons.
- Electron configurations of elements help explain the recurrence of physical and chemical properties.
- An element with eight electrons in its outer shell is stable and does not normally enter into chemical reactions. If the outer shell has less than four electrons, the element normally gives up electrons in chemical reactions. If the outer shell has more than four electrons, the element normally accepts electrons in chemical reactions.

Although there are several chemical and physical characteristics that indicate trends, this worksheet deals with only electronegativity. The *electronegativity* of an element is the tendency for the atoms of the element to attract electrons when they are chemically combined with atoms of another element. Electronegativity is

measured by the Linus Scale (an arbitrary scale) with values from 0 to 4. The most electronegative element has a value of 4. Elements with values below 1 are the least electronegative; this means that these elements do not have a tendency to gain electrons. The higher the electronegative value, the greater the tendency will be for the atom to gain electrons. Refer to your periodic table and locate period 3. **The electronegative values for period three are (from left to right) 0.9, 1.2, 1.5, 1.8, 2.1, 2.5, and 3.0.** (Note, by definition, group VIIIA (18) elements do not have an electronegativity value). **Find the group 2 metals; their electronegative values (from top to bottom) are 1.5, 1.2, 1.0, 1.0, 0.9, and 0.9.**

Using this information, complete the following data table:

Data Table

Period 3 Elements	Atomic Number	Electronegativity Value

Group 2 Elements	Atomic Number	Electronegativity Value

GRAPHS

1. On Graph 1, construct a line graph showing the relationship between electronegativity and atomic number of the period 3 elements. Use the x-axis for atomic number.
2. On Graph 2, construct a line graph showing the relationship between electronegativity and atomic number of the group 2 elements. Use the x-axis for atomic number.

QUESTIONS

1. What trend can be identified for electronegativity across a period of elements?

2. What trend can be identified for electronegativity down a group of metals?